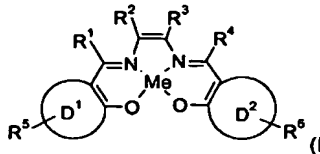
Claims

1. A metal complex of the following formula



(I), wherein

Me is a transition metal of Sub-Group 7, 8, 9, 10, 11 or 12, preferably 9, 10 or 11,

D^1 and D^2 are each independently of the other a carbocyclic or heterocyclic ring or ring system, which may be unsubstituted or substituted by one or more groups R^5 and R^6,

R^1 and R^4 are each independently of the other a hydrogen atom, a perfluoroalkyl radical, an unsubstituted or substituted alkyl radical, an aryl radical or an aralkyl radical,

R^2 and R^3 are a cyano group, or

R^2 and R^3 together form a five to seven membered heterocyclic ring, or

R^2 and R^3 together form an aromatic carbocyclic ring, which is substituted by at least one electron accepting substituent, or which is substituted by at least one electron donating substituent,

R^5 and R^6 being a halogen atom, such as fluorine, chlorine or bromine, a group $-NR^8R^9$, a group $-SO_2NR^8R^9$, wherein

R^8 and R^9 are each independently of the other a hydrogen atom, an alkyl group, a C_1-C_{24}alkylcarbonyl group, an alkyl group which is substituted by E and/or interrupted by D, a C_{6-24}aryl-carbonyl radical or C_{7-24}aralkyl-carbonyl radical, an aryl group, or an aralkyl group, or R^8 and R^9 together form a five- to seven-membered heterocyclic ring, which optionally can be interrupted by D,

a nitro group, a cyano group, a hydroxy group, an alkyl group, an alkyl group which is substituted by E and/or interrupted by D, an alkoxy group which is substituted by E and/or interrupted by D, an aryloxy group, an aralkyloxy group, an alkylthio group which is substituted by E and/or interrupted by D, an arylthio group, an aralkylthio group, an acyl radical, a phenyl group, an ester group, such as a phosphonic acid, phosphoric acid or carboxylic acid ester group, a carboxamide group, a sulfamide group, an ammonium group, a carboxylic acid, sulfonic acid, phosphonic acid or phosphoric acid group or a salt thereof,

wherein at least one of the substituents R^5 and at least one of the substituents R^6 is an electron donating group, if R^2 and R^3 together form an aromatic carbocyclic ring, which is substituted by at least one electron accepting substituent, or at least one of the substituents R^5 and at least one of the substituents R^6 is an electron accepting group, if

R^2 and R^3 together form an aromatic carbocyclic ring, which is substituted by at least one electron donating substituent, wherein

D is -CO-; -S-; -SO-; -SO_2-; -O-; -NR^{10}; and

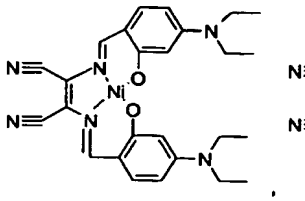
E is –OR^{11}; -SR^{11}; -$NR^{12}R^{13}$; -COR^{14}; -$COOR^{15}$; -$CONR^{12}R^{13}$; -CN; or halogen; wherein

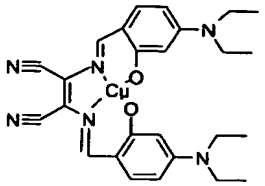
R^{10}, R^{12} and R^{13} are each independently of the other a hydrogen atom, an alkyl group, an aryl group, or an aralkyl group,

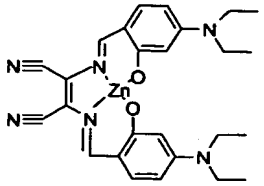
R^{11} is a hydrogen atom, an alkyl group, an aryl group, or an aralkyl group,

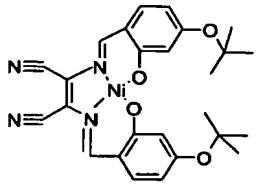
R^{14} is an alkyl group, an aryl group, or an aralkyl group, and

R^{15} is a hydrogen atom, an alkyl group, an aryl group, or an aralkyl group, with the proviso that the following compounds are excluded:



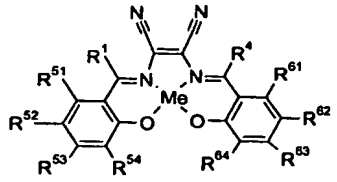




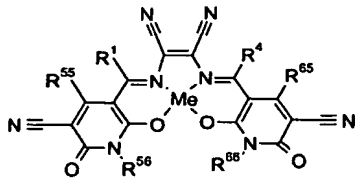


and

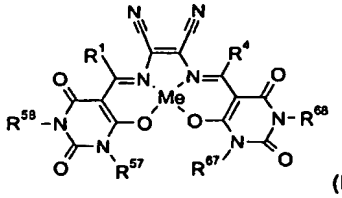
2. A metal complex according to claim 1, having the following formula



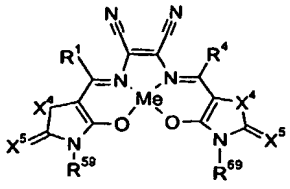
(IIa),



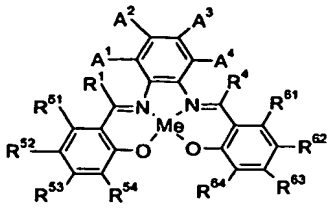
(IIb),



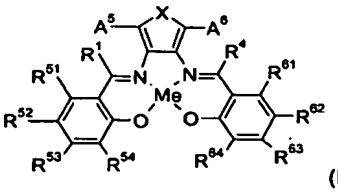
(IIc),



(IId),



(III), or



(IV), wherein

Me is Co^{3+}, especially Cu^{2+}, Ni^{2+}, Pd^{2+}, Pt^{2+}, Co^{2+}, or Zn^{2+},

X is >O, >S, >S=O, or $>SO_2$,

A^1, A^4, A^5 and A^6 are each independently of the other a hydrogen atom, an alkoxy radical, an alkyl radical, an alkyl radical which is interrupted one or more times by -O- or by -S-,

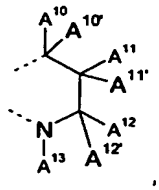
at least one of A^2 and A^3, preferably A^2 and A^3, are an electron accepting substituent, especially $-NO_2$, a halogen atom, especially a chlorine or a bromine atom, a group $-SO_2-NR^8R^9$ and the other is a hydrogen atom,

R^1 and R^4 are defined as in claim 1,

R^{51}, R^{52}, R^{54}, R^{61}, R^{62} and R^{64} are each independently of the other a hydrogen atom, or an C_1-C_{18}alkyl group,

R^{53} and R^{63} are each independently of the other a hydroxy group, an C_1-C_{18}alkoxy group, an C_6-C_{24}aryloxy group, an C_7-C_{24}aralkyloxy group, a group $-NR^8R^9$, or a salt thereof, wherein R^8 and R^9 are each independently of the other a hydrogen atom, an C_1-C_{18}alkyl group, an C_1-C_{18}alkyl group which is substituted by E and/or interrupted by D, an C_6-C_{24}aryl group, or an C_7-C_{24}aralkyl group, wherein D and E are as defined in claim 1, or

R^{53} and R^{52}, R^{53} and R^{54}, R^{63} and R^{62}, and/or R^{63} and R^{64} are each independently of the other

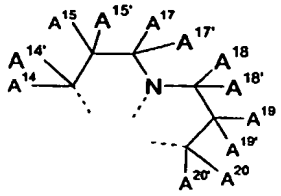


, wherein A^{10}, $A^{10'}$, A^{11}, $A^{11'}$, A^{12} and $A^{12'}$ are each independently of the other a hydrogen atom, or a C_1-C_8alkyl group, or

$A^{10'}$ and $A^{11'}$ together, form a double bond, and

A^{13} is a hydrogen atom or a C_1-C_8alkyl group, or

R^{53} and R^{52} and R^{54}, and/or R^{63} and R^{62} and R^{64} are



wherein A^{14}, $A^{14'}$, A^{15}, $A^{15'}$, A^{17}, $A^{17'}$, A^{18}, $A^{18'}$, A^{19}, $A^{19'}$, A^{20} and $A^{20'}$ are each independently of the other a hydrogen atom, or a C_1-C_8alkyl group,

R^{55} and R^{65} are each independently of the other a hydrogen atom, or a C_1-C_{18}alkyl group,

R^{56}, R^{57}, R^{58}, R^{59}, R^{66}, R^{67}, R^{68} and R^{69} are each independently of the other a hydrogen atom, a C_1-C_{18}alkyl group, or a C_1-C_{18}alkyl group, which is interrupted by one or more oxygen atoms, and

X^4 and X^5 are each independently of the other a sulfur, or oxygen atom.

3. A metal complex according to claim 2 having the formula II, III, or IV, wherein

Me is Co^{3+}, especially Cu^{2+}, Ni^{2+}, Pd^{2+}, Pt^{2+}, Co^{2+}, or Zn^{2+},

X is >O, >S, >S=O, or $>SO_2$,

A^1, A^4, A^5 and A^6 are a hydrogen atom,

A^2 and A^3 are $-NO_2$,

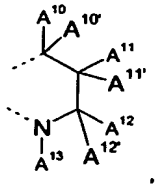
R^1 and R^4 are each independently of the other a hydrogen atom, a perfluoroC_1-C_8alkyl radical or a C_1-C_8alkyl radical,

R^{51}, R^{52}, R^{54}, R^{61}, R^{62} and R^{64} are a hydrogen atom, or

R^{51} and R^{52} together, and/or R^{61} and R^{62} together, form an unsubstituted or substituted phenyl ring,

R^{53} and R^{63} are each independently of the other a hydroxy group, an C_1-C_{18}alkoxy group, a group $-NR^8R^9$, wherein R^8 and R^9 are each independently of the other a hydrogen atom, an C_1-C_{18}alkyl group, a group $-(CH_2)_n-OH$, a group $-(CH_2CH_2O)_n-R^{16}$, where n is a number from the range 1-9 and R^{16} is H or C_1-C_{10}alkyl, or a salt thereof, or

R^{53} and R^{52}, R^{53} and R^{54}, R^{63} and R^{62}, and/or R^{63} and R^{64} are each independently of the other

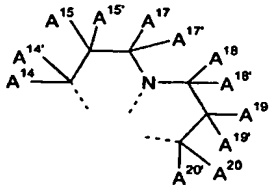


, wherein A^{10}, $A^{10'}$, A^{11}, $A^{11'}$, A^{12} and $A^{12'}$ are each independently of the other a hydrogen atom, or a C_1-C_8alkyl group, or

$A^{10'}$ and $A^{11'}$ together, form a double bond,

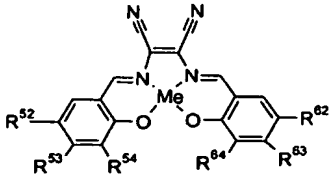
A^{13} is a hydrogen atom or a C_1-C_8alkyl group, or

R^{53} and R^{52} and R^{54}, and/or R^{63} and R^{62} and R^{64} are

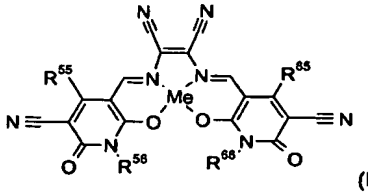


wherein A^{14}, $A^{14'}$, A^{15}, $A^{15'}$, A^{17}, $A^{17'}$, A^{18}, $A^{18'}$, A^{19}, $A^{19'}$, A^{20} and $A^{20'}$ are each independently of the other a hydrogen atom, or a C_1-C_8alkyl group.

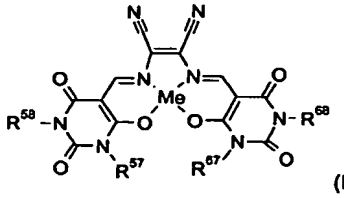
4. A metal complex according to claim 3, having the formula



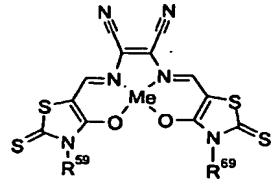
(IIa'),



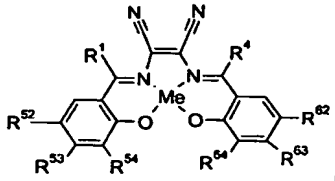
(IIb'),



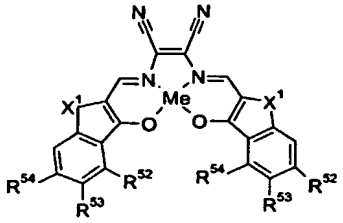
(IIc'),



(IId'),



(IIe),

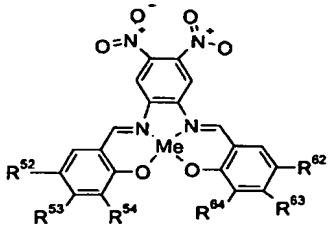


(IIf), wherein

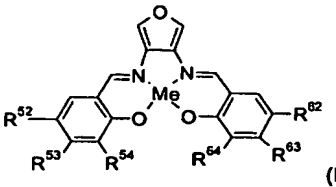
X^1 is a group -O-, -S-, or $-NR^{200}$-, wherein R^{200} is a hydrogen atom, or an alkyl group,

R^{55} and R^{65} are each independently of the other a hydrogen atom, or a C_1-C_{18}alkyl group,

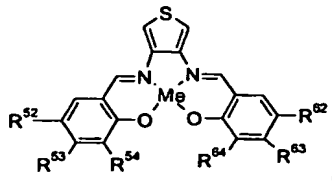
R^{56}, R^{57}, R^{58}, R^{59}, R^{66}, R^{67}, R^{68} and R^{69} are each independently of the other a hydrogen atom, a C_1-C_{18}alkyl group, or a C_1-C_{18}alkyl group, which is interrupted by one or more oxygen atoms,



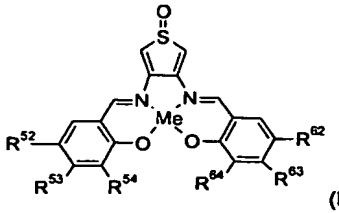
(IIIa), or



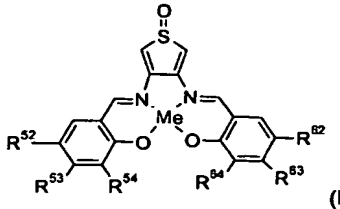
(IVa),



(IVb),



(IVc), or



(IVd), wherein

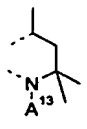
Me is Co^{3+}, especially Cu^{2+}, Ni^{2+}, Pd^{2+}, Pt^{2+}, Co^{2+}, or Zn^{2+},

R^1 is hydrogen and R^4 is C_1-C_4perfluoroalkyl,

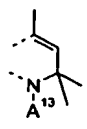
R^{52}, R^{54}, R^{62} and R^{64} are a hydrogen atom, or

R^{53} and R^{63} are each independently of the other a hydroxy group, an C_1-C_{18}alkoxy group, a group $-NR^8R^9$, wherein R^8 and R^9 are each independently of the other a hydrogen atom, an C_1-C_{18}alkyl group, a group $-(CH_2)_n$-OH, a group $(CH_2CH_2O)_n$-R^{16}, where n is a number from the range 1-9 and R^{16} is H or C_1-C_{10}alkyl, or a salt thereof, or

R^{53} and R^{52}, R^{53} and R^{54}, R^{63} and R^{62}, and/or R^{63} and R^{64} are each independently of the other a group of formula



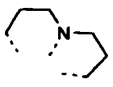
, or



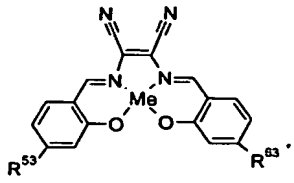
, wherein

A^{13} a hydrogen atom or a C_1-C_8alkyl group, or

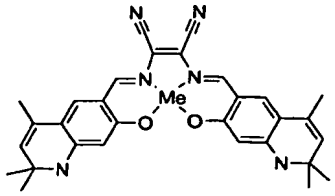
R^{53} and R^{52} and R^{54}, and/or R^{63} and R^{62} and R^{64} are a group of formula



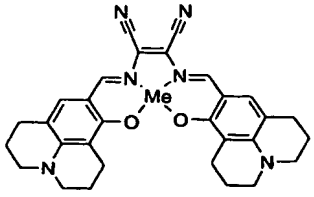
5. A metal complex according to claim 4:



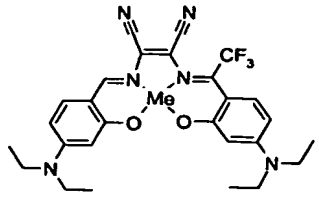
Compound	$R^{53} = R^{83}$	Me
A-1	$-N(CH_2)_2OH$	Ni^{2+}
A-2	$-N(CH_2)_2OH$	Cu^{2+}
A-3	$-N(CH_2)_2OH$	Co^{2+}
A-4	-OH	Ni^{2+}
A-5	-OH	Cu^{2+}
A-6	-OH	Co^{2+}
A-7	-ONa	Ni^{2+}
A-8	-ONa	Cu^{2+}
A-9	-ONa	Co^{2+}



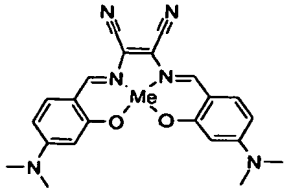
A-10 (Me = Ni^{2+})
A-11 (Me = Cu^{2+})
A-12 (Me = Co^{2+})



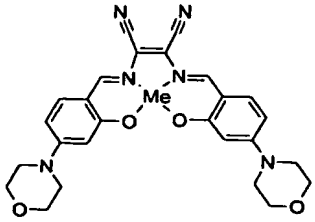
A-13 (Me = Ni^{2+})
A-14 (Me = Cu^{2+})
A-15 (Me = Co^{2+})



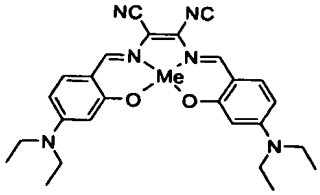
A-16 (Me = Ni^{2+})
A-17 (Me = Cu^{2+})
A-18 (Me = Co^{2+})



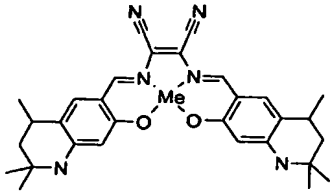
A-19 (Me = Ni^{2+})
A-20 (Me = Cu^{2+})
A-21 (Me = Co^{2+})



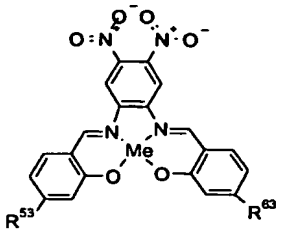
A-22 (Me = Ni^{2+})
A-23 (Me = Cu^{2+})
A-24 (Me = Co^{2+})



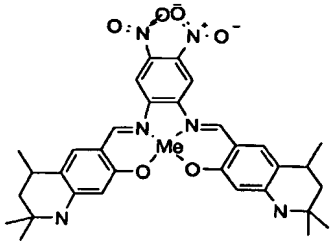
A-25 (Me = Cu^{2+})
A-26 (Me = Co^{2+})



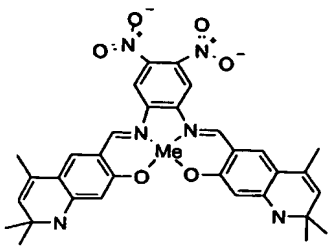
A-27 (Me = Ni^{2+})
A-28 (Me = Cu^{2+})
A-29 (Me = Co^{2+})



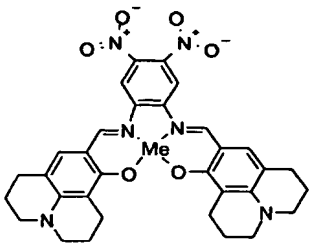
Compound	$R^{53} = R^{63}$	Me
B-1	$-N(CH_2)_2OH$	Ni^{2+}
B-2	$-N(CH_2)_2OH$	Cu^{2+}
B-3	$-N(CH_2)_2OH$	Co^{2+}
B-4	-OH	Ni^{2+}
B-5	-OH	Cu^{2+}
B-6	-OH	Co^{2+}
B-7	-ONa	Ni^{2+}
B-8	-ONa	Cu^{2+}
B-9	-ONa	Co^{2+}
B-10	$-ONH_4$	Ni^{2+}
B-11	$-ONH_4$	Cu^{2+}
B-12	$-ONH_4$	Co^{2+}



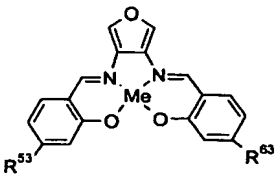
B-13 (Me = Ni^{2+})
B-14 (Me = Cu^{2+})
B-15 (Me = Co^{2+})



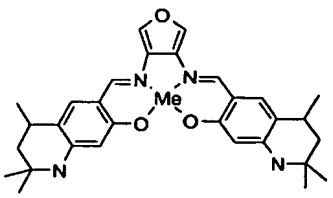
B-16 (Me = Ni^{2+})
B-17 (Me = Cu^{2+})
B-18 (Me = Co^{2+})



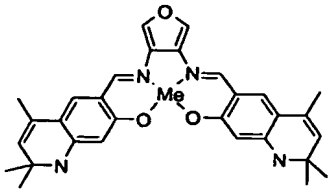
B-19 (Me = Ni^{2+})
B-20 (Me = Cu^{2+})
B-21 (Me = Co^{2+})



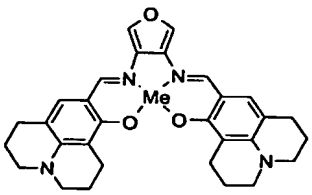
Compound	$R^{53} = R^{83}$	Me
C-1	$-N(CH_2)_2OH$	Ni^{2+}
C-2	$-N(CH_2)_2OH$	Cu^{2+}
C-3	$-N(CH_2)_2OH$	Co^{2+}
C-4	-OH	Ni^{2+}
C-5	-OH	Cu^{2+}
C-6	-OH	Co^{2+}



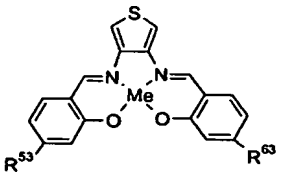
C-7 (Me = Ni^{2+})
C-8 (Me = Cu^{2+})
C-9 (Me = Co^{2+})



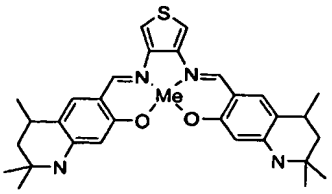
C-10 (Me = Ni^{2+})
C-11 (Me = Cu^{2+})
C-12 (Me = Co^{2+})



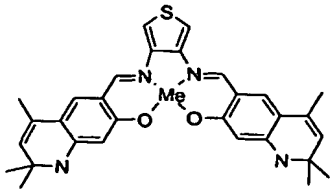
C-13 (Me = Ni^{2+})
C-14 (Me = Cu^{2+})
C-15 (Me = Co^{2+})



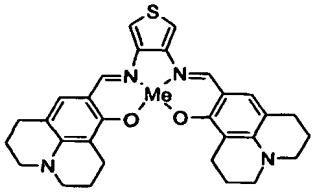
Compound	$R^{53} = R^{63}$	Me
D-1	$-N(CH_2)_2OH$	Ni^{2+}
D-2	$-N(CH_2)_2OH$	Cu^{2+}
C-3	$-N(CH_2)_2OH$	Co^{2+}
D-4	-OH	Ni^{2+}
D-5	-OH	Cu^{2+}
D-6	-OH	Co^{2+}



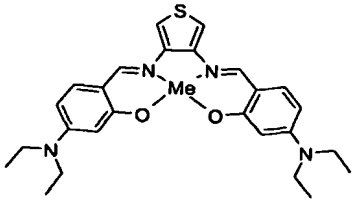
D-7 (Me = Ni^{2+})
D-8 (Me = Cu^{2+})
D-9 (Me = Co^{2+})



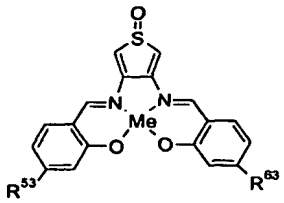
D-10 (Me = Ni^{2+})
D-11 (Me = Cu^{2+})
D-12 (Me = Co^{2+})



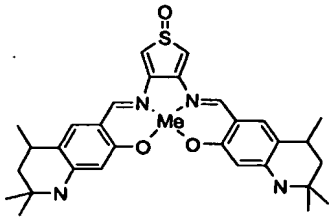
D-13 (Me = Ni^{2+})
D-14 (Me = Cu^{2+})
D-15 (Me = Co^{2+})



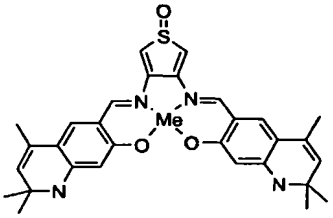
D-16 (Me = Ni^{2+})
D-17 (Me = Cu^{2+})
D-18 (Me = Co^{2+})



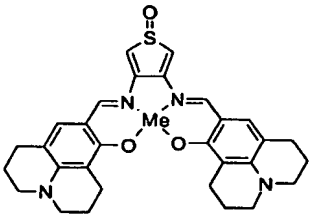
Compound	$R^{53} = R^{63}$	Me
E-1	$-N(CH_2)_2OH$	Ni^{2+}
E-2	$-N(CH_2)_2OH$	Cu^{2+}
E-3	$-N(CH_2)_2OH$	Co^{2+}
E-4	-OH	Ni^{2+}
E-5	-OH	Cu^{2+}
E-6	-OH	Co^{2+}



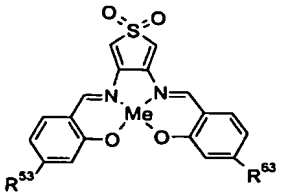
E-7 (Me = Ni^{2+})
E-8 (Me = Cu^{2+})
E-9 (Me = Co^{2+})



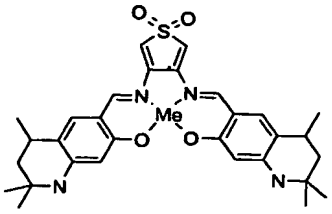
E-10 (Me = Ni^{2+})
E-11 (Me = Cu^{2+})
E-12 (Me = Co^{2+})



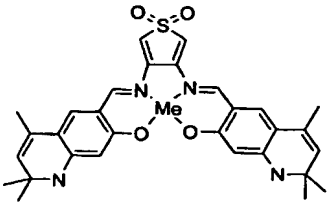
E-13 (Me = Ni^{2+})
E-14 (Me = Cu^{2+})
E-15 (Me = Co^{2+})



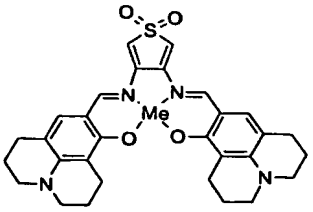
Compound	$R^{53} = R^{63}$	Me
F-1	$-N(CH_2)_2OH$	Ni^{2+}
F-2	$-N(CH_2)_2OH$	Cu^{2+}
F-3	$-N(CH_2)_2OH$	Co^{2+}
F-4	-OH	Ni^{2+}
F-5	-OH	Cu^{2+}
F-6	-OH	Co^{2+}



F-7 (Me = Ni^{2+})
F-8 (Me = Cu^{2+})
F-9 (Me = Co^{2+})

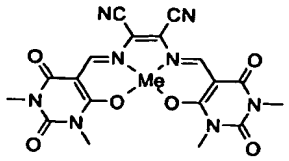


F-10 (Me = Ni^{2+})
F-11 (Me = Cu^{2+})
F-12 (Me = Co^{2+})

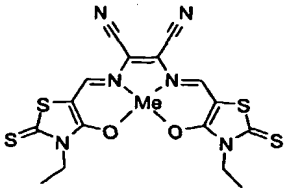


F-13 (Me = Ni^{2+})
F-14 (Me = Cu^{2+})
F-15 (Me = Co^{2+})

Compound	R^{71}	R^{72}	Me
G-1	$-CH_3$	$-CH_3$	Ni^{2+}
G-2	$-CH_3$	$-CH_3$	Cu^{2+}
G-3	$-CH_3$	$-CH_3$	Co^{2+}
G-4	$-CH_3$	$-(CH_2)_3OCH(CH_3)_2$	Ni^{2+}
G-5	$-CH_3$	$-(CH_2)_3OCH(CH_3)_2$	Cu^{2+}
G-6	$-CH_3$	$-(CH_2)_3OCH(CH_3)_2$	Co^{2+}
G-7	$-CH_3$	H	Ni^{2+}
G-8	$-CH_3$	H	Cu^{2+}
G-9	$-CH_3$	H	Co^{2+}



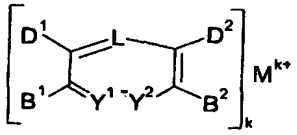
H-1 (Me = Ni^{2+})
H-2 (Me = Cu^{2+})
H-3 (Me = Co^{2+})



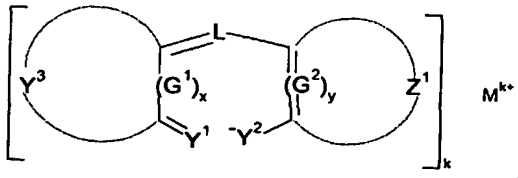
I-1 (Me = Ni^{2+})
I-2 (Me = Cu^{2+})
I-3 (Me = Co^{2+})

6. A composition, comprising
(a) a metal complex according to any one of claims 1 to 5, and
(b) a dye.

7. A composition according to claim 6, wherein
Me in formula I, II, III or IV is Ni^{2+}, Cu^{2+}, or Co^{2+} and the dye is a oxonol dye of formula



(Va) or



(Vb),

wherein D^1, D^2, B^1 and B^2 are in each case a substituent; Y^3 and Z^1 are in each case a group of atoms necessary for the formation of a carbocyclic or heterocyclic ring; G^1 and G^2 are in each case a group of atoms necessary for the formation of a chain having conjugated double bonds; Y^1 is =O, $=NR^{109}$ or $=C(CN)_2$, R^{109} being a substituent; Y^2 is -O, $-NR^{109}$ or $-C(CN)_2$, R^{109} being a substituent; L is a methine group, which may be substituted, or a group by means of which a polymethine group is

completed, it being possible for 3, 5 or 7 methine groups to be connected in order to form a chain having conjugated double bonds, which chain may be substituted, x and y are 0 or 1, M^{k+} is an organic or inorganic cation, and k is an integer from 1 to 10

8. An optical recording medium comprising a substrate and at least one recording layer, wherein the recording layer comprises a metal complex according to any one of claims 1 to 5 or a composition according to claim 6 or 7.

9. Use of a metal complex according to any one of claims 1 to 5 or a composition according to claim 6 or 7 in the production of optical recording media, colour filters (optical filters) and printing inks.

10. A method of producing an optical recording medium, wherein a solution of a metal complex according to any one of claims 1 to 5 or a composition according to claim 6 or 7 in a solvent, especially a non-halogenated solvent, is applied to a substrate having depressions.